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PROCEEDINGS

The Ecological Society held its annual meeting with the American Association for the Advancement of Science at St. Louis, December 30, 1919, to January 1, 1920, inclusive. The program was as follows:

COMMITTEE ON COOPERATION: [BARRINGTON MOORE, Chairman; C. C. ADAMS, and T. L. HANKINSON, New York State College of Forestry; G. P. BURNS, Vermont Agricultural Experiment Station; and NORMAN TAYLOR, Brooklyn Botanic Garden] Plants and Animals of Mt. Marcy, New York.

Studies of the alpine vegetation reveal that of 67 species of flowering plants found above the timber line only about 23 are true alpine, the balance of the vegetation being composed of plants from lower elevations, which, changed in stature, color and ability to set seed, are gradually encroaching over the mountain-top. Forty years ago only 53 species were recorded from the summit. Fourteen additional ones have been recently discovered, nearly all of which are apparently migrants from below timber line.

STEPHEN E. WILLIAMS, Miami University. Observations on the habits of larval colonies of *Pectinatella*. (A. S. Z.)

V. E. SHELFORD, Illinois Natural History Survey. Hydrogen ion concentration in the different stages of pond succession. 15 min. (E. S. A.)

The discussion will cover the plants and animals present; H ions in different stages; the reactions of fishes to H ions in relation to succession; comparison of ponds with streams and bayous; seasonal differences.

W. C. ALLEE, Lake Forest University. Animal Aggregations. (A. S. Z.)

A. D. HOWARD, U. S. Bureau of Fisheries. Distribution of life on a river bottom. 15 min. (E. S. A.)

In an investigation to determine the distribution of fresh-water mussels a somewhat detailed study was made of the whole bottom in a portion of a river. The area studied was a three-mile section of one channel of the Mississippi River between Rock Island, Illinois, and Muscatine, Iowa. The river in this section is comparatively straight and of rather uniform character (gradient, depth, etc.) passing over soil of clay, sand and sedimentary rock (mostly limestone).

The life on the bottom was found to have a rather definite distribution with reference to physiographic features of the river. In general this benthos was restricted to a zone 200 feet wide along each shore. Where islands occurred a narrower zone was found along the shores of the islands. This zone apparently had no particular relation to depth of water as the middle area of the stream, about 500 feet wide, was no deeper than the 200 feet

strips along shore. The latter are by no means equally productive throughout. The more densely populated portions are unquestionably distributed in relation to definite positions of the channel and other features; the channel being defined as the main body of flowing water in the river following usually the more excavated portion of the stream bed. On account of the changeableness of the channel in sandy sections of the river, features which insured permanency of condition were found an important factor in the bottom life at any given place.

The productive areas were usually parts of the shore strips that were bathed by the current; that is, in general, where the channel approaches the shore. Character of soil was a determining feature as in other bodies of water but this is often controlled by current, relation to channel, topography, and such features. The possibility of greater food content of the water at the more productive areas was considered but not investigated in this particular locality as there seemed to be no reason for expecting it to be an important variable here. Doubtless, there is some local affect from contributions of the banks and the plankton of small tributaries.

In the life zones variation from swift to comparatively slow water were observed accommodating species adapted to these varied habitats.

CHAUNCEY JUDAY, Wisconsin Natural History Survey. Behavior of the larvae of *Corethra punctipennis* Say. (A. S. Z.)

A. D. HOWARD, U. S. Bureau of Fisheries. Changes observed in river fauna above Keokuk Dam. 15 min. (E. S. A.)

Keokuk Lake five years after its formation by the dam across the Mississippi River was examined to determine some of the effects of the changed conditions. In the portions of the lake occupying the bed of the river it was possible to examine productive life areas and compare the conditions with those existing in the former river. Some lands flooded by the elevation of the water have since been reclaimed by dyking. These give the opportunity to study advantageously the extension of pioneer aquatic species in the brief interval of submergence. Animals in the productive life areas of the former river-bed are subjected to a considerable decrease in current, an increase in depth of water with a heavy precipitation of fine black mud. Collections very obviously show the suppression of characteristic river species and the increase of pond or lake dwelling forms. A conspicuous increase in aquatic plants as compared with the usual river flora was observed.

LESLIE B. AREY, Northwestern University, and W. J. CROZIER, University of Chicago. On the natural history of *Onchidium*. (A. S. Z.)

ROYAL N. CHAPMAN, University of Minnesota. Ecological succession of insects in stored food products. 15 min. (E. S. A.)

A. A. SCHAEFFER, University of Tennessee. On a new principle underlying movement in organisms. (A. S. Z.)

H. C. COWLES, University of Chicago. The rising rock shores of northern Lake Michigan. 20 min., lantern.

Lake Michigan has many examples both of building shores and eroding shores. The chief building type is the sandy shore with its associated dunes, perhaps unequalled in their display of vegetation types. The chief eroding type is represented by the cliffs of glacial clay. Especially northward there are building shores of sand mixed with wood drift, of shingle, and of silt. Eroding rock shores are relatively infrequent and are best displayed in Door County, Wisconsin, which forms a peninsula between Green Bay and Lake Michigan. The shores of northern Lake Michigan are noted for their considerable elevation during post glacial time. That rapid elevation is still continuing has been appreciated only recently, and the best measure of the rate of rise is furnished by the plants that invade the bared surfaces. The region also furnishes a good instance of a progressive succession rapidly accelerated by a favorable physiographic change. A sinking shore, as in parts of Lake Erie, illustrates retrogressive succession.

J. V. HOFMANN, U. S. Forest Service. The establishment of a Douglas Fir Forest (*Pseudotsuga taxifolia*). 15 min.

The Douglas fir has gained and held possession of the greater part of the forested area of the Cascade and Coast region of Washington and Oregon. Its dominant position has been attained not through any one characteristic but by its ability to overcome many varying and extreme conditions through a grouping and regrouping of a number of characters, giving the tree a wide range of adaptation. The seed of Douglas fir is peculiarly adapted for regeneration. Those remaining near the surface and receiving favorable temperatures will germinate, but the seedlings do not become established. The tree is intolerant of shade, especially in cool situations. When the forest is removed by fire or cutting the stored seed is left under favorable conditions for germination. The ability of Douglas fir to develop a root system 6 to 8 inches deep during the early part of its first growing season is an important factor in its establishment.

C. C. ADAMS, New York State College of Forestry. The Roosevelt Wild Life Forest Experiment Station,—a new ecological station. 20 min.

W. A. CANNON, Desert Laboratory. Some characteristics of precipitation in arid regions. 10 min.

One of the characteristics of the storms of northern South Australia is the relatively large proportion of the annual rainfall which occurs in separate storms too small to benefit plants. Thus at Oodnadatta, where the annual precipitation is 4.68 inches, so much as 56.7 percent of this may occur in storms each of which would amount to .15 inch or less. Such rains do not penetrate the ground sufficiently, neither does the soil remain wetted long enough, to be made use of by the roots either of annuals or of perennials.

C. A. SHULL, University of Kentucky. Changes in the vegetation of Kentucky. 10 min. (B. S. A.)

W. A. CANNON, Desert Laboratory, and E. E. FREE. Soil aeration and growth of roots. 20 min., lantern. (E. S. A.)

Experimental work on the root reaction of species to soil atmospheres of different compositions indicate that the roots of land plants of various habits and from a variety of habitats, may exhibit reactions which are different but wholly consistent and characteristic. At one end of the series stands *Coleus*, and possibly *Covillea*, which are extremely sensitive to oxygen deprivation and to large amounts of carbon di-oxide, and at the other end *Salix* and *Eucalyptus*, which are indifferent, either to the one or the other. Among the gases used were nitrogen and helium and it was found that those employed contained a small amount of oxygen, nitrogen about .5 percent, and helium about .2 percent. The latter gas effected root growth less injuriously than the former. This difference in behavior is ascribable to the more rapid movement of oxygen in helium than in nitrogen. The rate of oxygen supply therefore is of greater importance than the oxygen pressure *per se*.

FRANK C. CATES and ALICE E. KEENER, Kansas State Agricultural College. Red coloring in the leaves of *Diervilla lonicera*. 7 min. (B. S. A.)

GEORGE D. FULLER, University of Chicago. An edaphic limit to forests in the prairie region of Illinois. 15 min., lantern. (E. S. A.)

A soil survey has shown the existence of two soil types in the prairie region of Illinois. One type has as its vegetation grassland, the other forest. The soil of the forest is similar to the subsoil of the prairie areas but is better drained. Its extent is related to the amount of stream erosion and so strictly is the forest limited to this type as to lead to the conclusion that here at least the character of the soil is the factor in deciding the limits of tree growth.

ARTHUR G. VESTAL, Eastern Illinois State Normal School. The vegetation component as the unit in mixed associations. 12 min. (B. S. A.)

EDITH B. SHREVE, Desert Laboratory. Seasonal changes in the water relations of desert plants. 15 min. (E. S. A.)

The daily march of transpiration and of leaf-water content were measured for a perennial (*Encelia farinosa*), a winter annual (*Streptanthus arizonicus*) and a summer annual (*Amaranthus palmeri*) for the seasons in which they live. *Streptanthus* is living in January and February under the most arid conditions it can endure and has no means of coping with the much more arid conditions of June. *Encelia* is able by some internal regulation to keep its loss of water per unit area down to only 1.4 times as much in June as in January, although the ratio of evaporation to soil moisture is 4.5 times as great in the former month. *Amaranthus* can withstand a greater aridity than *Streptanthus* but can not endure the arid conditions of September, which are only one-third as severe as in June.

FRANCIS RAMALEY, University of Colorado. Some mountain plant communities of sandy soil. 15 min. (B. S. A.)

J. E. WEAVER, University of Nebraska. Correlation between the root development of cereals and grassland associations. 20 min. (E. S. A.)

Studies of the root development of winter wheat (*Triticum aestivum*), oats (*Avena sativa*), and winter rye (*Secale cereale*) have been made at 13 stations in the states of Colorado, Kansas, Nebraska, and South Dakota. These stations are all in the prairie-plains grassland formation and were selected as typically representative of conditions in the three grassland associations. One group in eastern Nebraska lies in the true prairies (*Stipa-Koeleria* association) which is dominated by tall sod-forming grasses and is further characterized by an abundance of herbaceous societies. Another group in Colorado and western Kansas represents short-grass plains vegetation (*Bulbilis-Bouteloua* association) where tall grasses are practically absent and relatively few, poorly developed, herbaceous societies are found. The third group in central Kansas and western South Dakota is located in the mixed prairies (*Stipa-Bouteloua* association) where tall and short grasses meet on somewhat equal terms, the latter forming an understory to the taller grassy and herbaceous vegetation.

The results of examination of the average stem height and the working depth and maximum depth of roots in 44 fields reveal the fact that there is a direct correlation between cereal crop plant development and the environment as expressed in the development of the natural vegetation. In true prairies crop plants reached their greatest stem and root development; in the short-grass plains the least; while growth in the mixed prairies was intermediate.

W. B. McDUGALL, University of Illinois. Perennial root-hairs of *Gleditsia* and related genera. 5 min. (B. S. A.)

C. A. SHULL, University of Kentucky. The formation of a new island in the Mississippi River. 7 min. (E. S. A.)

During the last six years an island has been forming in No. 5 shoot of the Mississippi River, the channel which separate Wolf Island from the Missouri bank of the river, almost opposite Columbus, Ky. The island is now somewhat over a half mile in length, and about an eighth of a mile in average width. Its area is in the neighborhood of fifty acres, and it stands high enough to require a 43-foot stage of the river to inundate it. It is covered with a very fine growth of young cottonwoods, about three inches in diameter and twenty-five feet tall. The history of the island is remarkable, as it is known to have been started by a barge which stranded on a rock bar in No. 5 shoot during the recession of the great flood of 1913. This barge formed the original obstruction to the current which caused deposition, and is now completely buried near the head of the island.

FRANK D. KERN, Pennsylvania State College. Some recent observations on the dissemination of the barberry. 6 min. (B. S. A.)

A. E. DOUGLASS, University of Arizona. Evidence of climatic effects in the annual rings of trees. 12 min., lantern. (E. S. A.)

The rings of the yellow pine in northern Arizona show varying thickness in marked correlation with rainfall; the sequoias of California show similar characteristics in less degree. Climatic effects may also be detected by similarity in ring-growth over large areas. A characteristic called "mean sensitivity" is suggested as a possible measure of climatic reaction.

T. J. FITZPATRICK. The fern flora of Nebraska. 10 min. (B. S. A.)

NORMA E. PFEIFFER. Ecological relations of the genus *Isoetes*. 15 min. (B. S. A.)

BRUCE FINK. The taxonomic and biologic relations of the Graphidaceae. 15 min. (B. S. A.)

ADELE LEWIS GRANT. A discussion of the genus *Mimulus*. 15 min. (B. S. A.)

EDWIN B. PAYSON. Geographical distribution of the genus *Lesquerella*. 10 min. (B. S. A.)

The business meeting of the Ecological Society of America, held in the Soldan High School, St. Louis, Missouri, was called to order at 2:30 P.M. on December 31, 1919, by the President, Major Barrington Moore.

The address of the president was then delivered.

The report of the retiring secretary-treasurer, Forrest Shreve, was read by the acting secretary. This report is printed below.

Upon motion duly seconded the report was accepted.

In response to a request from Prof. F. R. Lillie, chairman of the Committee on Cooperation in the Division of Biology and Agriculture of the National Research Council, it was moved, seconded, and resolved that the present committee on cooperation of the Ecological Society consisting of Major Moore, chairman, and Messrs. C. C. Adams, Geo. P. Burns, T. L. Hankinson, Norman Taylor and H. L. Shantz be instructed to act as an advisory committee in cooperation with the Division of Biology and Agriculture of the National Research Council.

The committee on the preservation of natural conditions for ecological study reported through its chairman V. E. Shelford that progress was being made and requested that the committee be continued and authorized to make the necessary expenditure for preparing its report.

It was moved, seconded and resolved that the report of progress be accepted and the committee continued. No written report was submitted.

The question of whether the Society undertake, at the present time, the publication of a journal was brought before the meeting by the President and a discussion followed which was participated in by Messrs. MacDougal, Burns, Adams, Livingston, Cowles, Waterman and others.

It was moved and seconded that the annual dues of the society be for the future \$2.50.

It was moved in amendment that the amount of the annual dues be \$3.00. The amendment was seconded and carried.

It was moved, seconded and resolved that the offer of the Plant World Association to turn over that journal to the Ecological Society be accepted and that the Plant World be made the official organ of this society.

It was moved, seconded and resolved that the subscription price of the Plant World be in the future \$3.00 but that the present subscribers be permitted to renew their subscription for 1920 at the present rate of \$2.50.

It was moved, seconded and resolved that a second class of non-subscribing members be created and such members be accepted for a period of not more than three years each at an annual fee of \$1.00 each. Such members shall be expected to become subscribing members at or before the expiration of three years and are only then entitled to receive the journal of the Society.

It was moved, seconded and resolved that the president of the society be directed to associate with himself two others to act as a committee to confer with a committee from the Plant World Association upon all matters relative to the taking over of the Plant World, and that this committee be given full power to act in all matters relating to the editing and publishing of this journal as the official organ of the Ecological Society.

The chairman of the committee on nomination of officers, Prof. H. C. Cowles, submitted the following recommendation for officers for the ensuing year:

President: Major Barrington Moore,

Vice-President: George E. Nichols,

Secretary-Treasurer: A. O. Weese.

Moved, seconded and carried that the acting secretary be instructed to cast a ballot for the list of officers recommended by the committee on nominations. The ballot was cast and the officers declared duly elected.

Upon motion duly seconded, it was resolved that the secretary be instructed to convey to the retiring secretary, Forrest Shreve, the high appreciation of the Ecological Society of America for his faithful and most efficient service during these early and critical years of its existence.

The President announced as the additional members of the committee for taking over the Plant World Messrs. C. C. Adams and Norman Taylor.

The meeting then adjourned.

GEORGE D. FULLER,
Acting Secretary

REPORT OF SECRETARY-TREASURER FOR 1919

Meetings.—The last regular meeting of the society was held at Baltimore in Convocation Week 1918, and a summer meeting was held on June 19 and 20 at the Throop College of Technology at Pasadena, California. At the former meeting joint sessions were held with the American Society of Zoologists and the Botanical Society of America, and at the latter meeting with the Western Society of Naturalists and the Cooper Ornithological Club.

Field Trips.—During the past year no field trips have been held under the auspices of the Society. More extended work was done in the field, however, by five members of the Committee on Cooperation, at Mt. Marcy, New York. It is to be hoped that the return of normal conditions in our educational institutions will enable us to resume field excursions in different parts of the country. The holding of such excursions was one of the primary objects in the formation of the Ecological Society, and their value needs no demonstration.

Bulletin.—The bulletin was changed in 1919 from monthly to bi-monthly appearance, and six numbers have been issued.

Membership.—Twenty-three new members have joined the Society in 1919 and two resignations have been received, making the present membership 370.

Arrears of Dues.—It is found that the number of members in arrears for 1917 is 35, for 1918 is 63, and for 1919 is 110. It is suggested that no action be taken at present regarding the members who are two years in arrears, as letters have recently been written which will call the attention of the delinquents to this matter and will doubtless be the means of saving them to the membership of the society.

Committees.—The standing investigative committees of the society are as follows:

Committee on Cooperation: Barrington Moore, Chairman.

Committee on the Preservation of Natural Conditions for Ecological Study: V. E. Shelford, Chairman.

Committee on Soil Temperature: Forrest Shreve, Chairman.

The resignation of Dr. A. S. Pearse as chairman of the Committee on Fresh Water Fish and Fisheries has resulted in no further action by that committee.

Finances.—The income and expenditures of the society during the past year have been as follows:

Income:

Balance from 1918	\$ 31.73	
Dues and subscription to Bulletin.....	292.50	
Refund on stationery	3.80	\$328.03

Expenses:

Assistant Secretary	\$ 75.00	
Committee on Preservation	19.53	
Committee on Soil Temperature	4.50	
Affiliation Fee, Pacific Div. A. A. A. S.	5.00	
Printing Bulletin	80.75	
Miscellaneous printing	12.00	
Stationery	9.65	
Postage	22.63	
Express, telegrams and incidentals.....	20.35	249.41
Balance on hand		\$ 78.62

The above statement does not include cost of printing the program of the St. Louis Meeting, for which bill has not yet been rendered. The dues now in arrears afford a potential asset of \$208.

Respectfully submitted,

FORREST SHREVE,
Sec'y-Treasurer

TUCSON,
December 26, 1919

REPORT OF COMMITTEE ON SOIL TEMPERATURE

FORREST SHREVE, *Chairman*; ALFRED E. CAMERON

This committee has now been engaged for three years in an effort to obtain, through cooperative observers, as large a series of soil temperature data as possible. The original plans for the work of the committee called for a series of well distributed stations throughout the United States and Canada at which soil thermographs should be run at stated depths and under conditions as nearly comparable as possible with respect to soil texture, character of surface, slope exposure and drainage. Very loyal and enthusiastic cooperation has been secured from persons both in and outside the Ecological Society, and any value that may attach to the assembled results stands much more to the credit of the cooperators than to that of the committee.

The list of 29 stations published in the Bulletin for February, 1918, indicates the original scope of the observations. Unfortunately seven of these stations have been discontinued, chiefly through the movement of the observers to other fields of work, and partly through the policy of the Forest Service to abandon some of their investigative laboratories, which had unfortunately been placed in the midst of National Forests in close proximity to the problems which they were designed to investigate. At four of the stations it has not been possible for the cooperators to continue their observations throughout the year. At five others it was impossible to secure thermographs, and readings with soil thermometers have been made.

The original plan of the soil temperature survey called for readings at a depth of 3 inches or else at 12 inches, or at both depths. At two stations we have fine series at these two depths. Most of the thermograph data are for 3 inches, while most of the thermometer readings are for 12 inches. The stations at which more than one thermograph is in operation are those at Burlington, Vt., maintained by Prof. George P. Burns, and at College Park, Md., under Dr. A. G. McCall; while at Flagstaff, Ariz., Mr. G. A. Pearson is maintaining valuable series of thermometer observations at several depths as well as at several altitudes on the San Francisco Peaks. Prof. C. W. Edgerton, at Baton Rouge, La., has also obtained two series on different types of soil.

Owing to the fact that many of the cooperators have an interest in the data secured, in connection with their own work, it has not been possible to hold all of them to the depths at which it was desired to secure the observations. This results in the possession of several fine series of thermograph records which are not comparable with those of any other stations. While such data are of some value in themselves they do not contribute to the information necessary for the construction of a map of the soil isotherms of the United States and Canada, which it was hoped at the outset would be one of the final concrete expressions of the cooperative work of the committee.

It was originally planned to carry on the work of the committee for only three years. As it is still desirable to secure fresh stations and especially continued readings at the proper depths, and as all of the cooperators are taking such enthusiastic interest in the work, it is the hope of the committee that the Society will feel moved to authorize a continuation of this cooperative investigation. Two new stations have recently been secured in the United States and three in Canada, the records from which will add very materially to the value of the survey because of the critical points at which the stations are located.

The cost of the work of this committee for the past year has been \$4.50. The records of the observers have been inspected and tabulated, and it seems desirable to publish at an early date some of the figures which are now in hand.

The committee will greatly appreciate information regarding any readings of soil temperature that have been taken in the past, and will welcome the cooperation of any members of the society.

Respectfully submitted,

FORREST SHREVE,

Chairman

TUCSON, ARIZ.,

December 26, 1919